

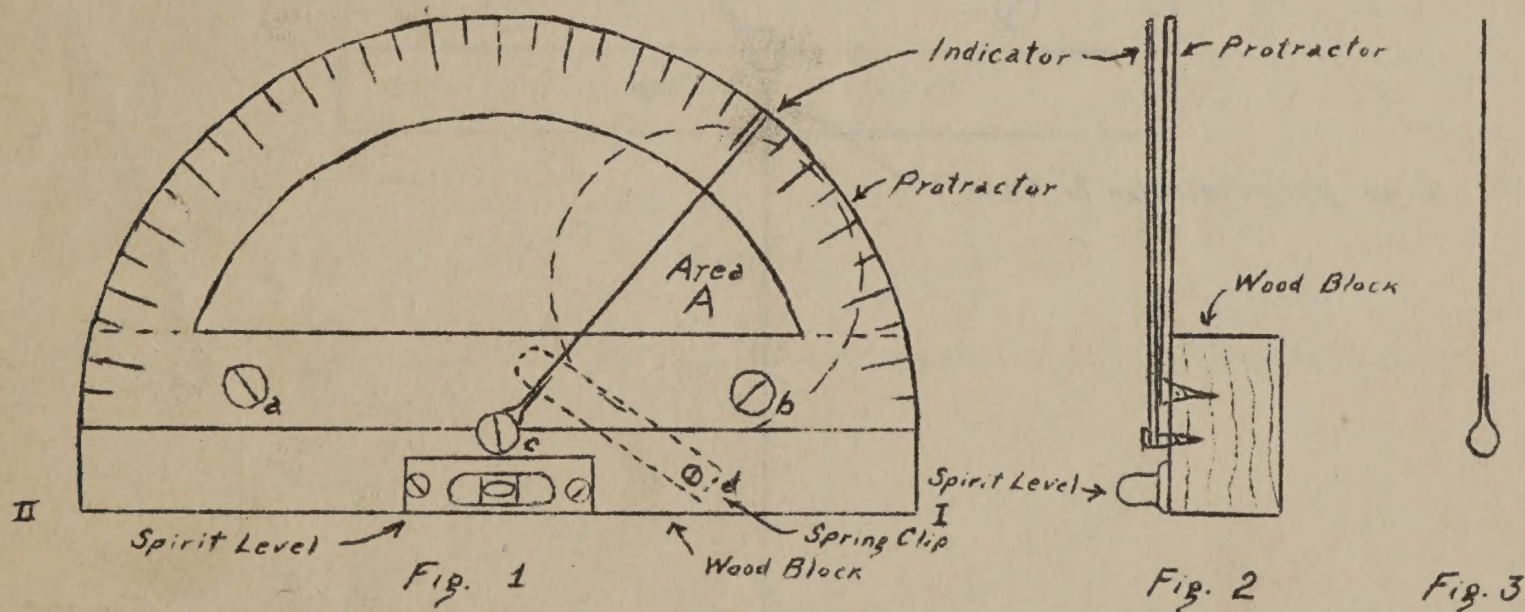
A SIMPLE INEXPENSIVE DEVICE FOR MEASURING DEGREE AND/OR PERCENT OF SLOPE

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The simplicity and cheapness of materials used in construction immediately limit the accuracy of this instrument. However, it may be depended upon to more nearly approximate the degree and/or percent of slope than an estimate made by eye alone.

The materials consist of: a protractor (which may be purchased for ten cents), a block of wood, a spirit (bubble) level (which need not be expensive) or a plumb bob, a piece of wire, five or six short screws and a tin spring clip if desired.

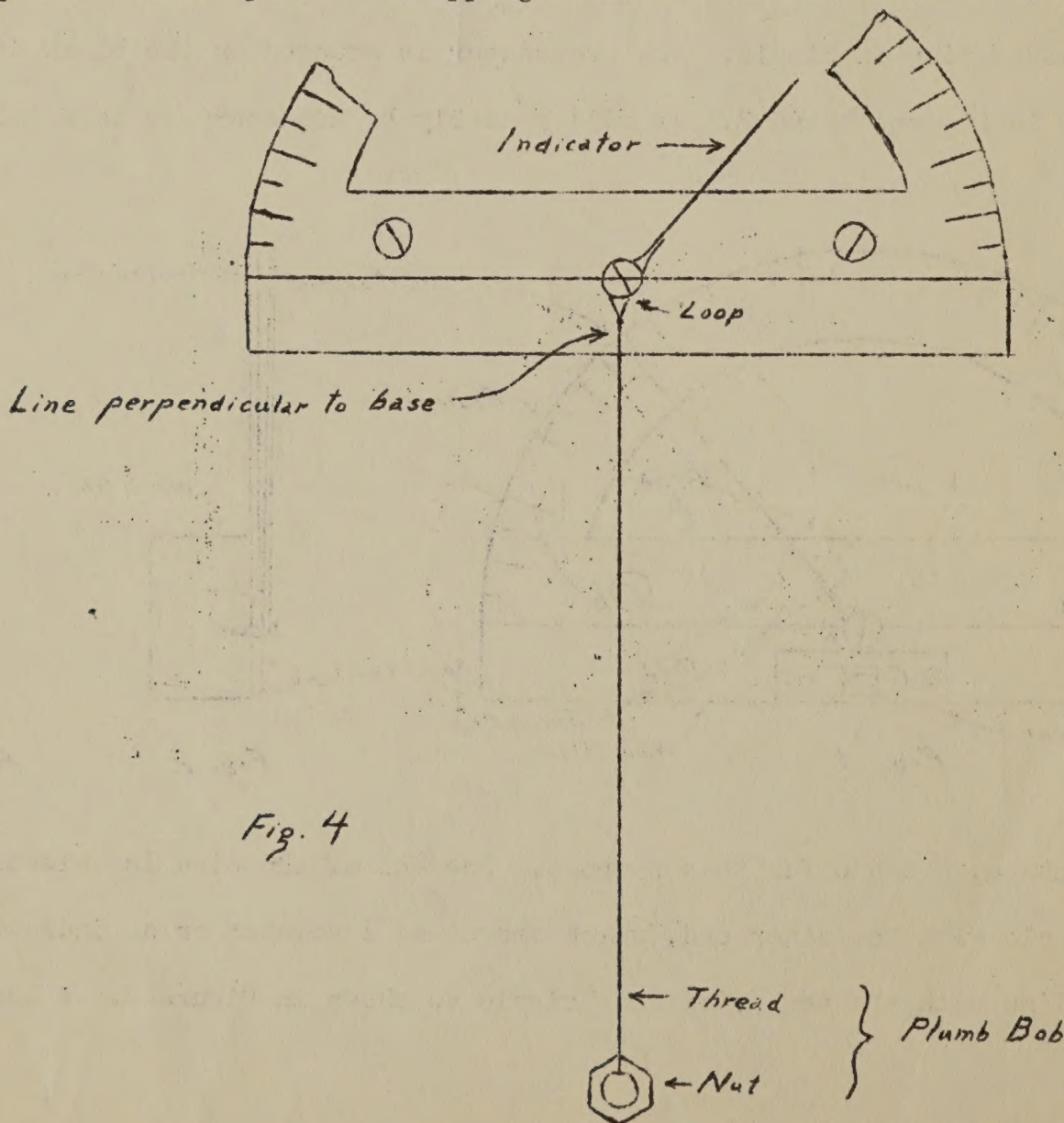
Construction is simple. The protractor is mounted on the block of wood as shown in Figures 1 and 2. It will probably be necessary to have holes



bored at points a, b and c for this purpose. One end of the wire is twisted to form a circle with the other end, which serves as a pointer or an indicator, directly in line with the center of this circle as shown in Figure 3. A screw

is passed through this circle and the indicator secured (not too tightly) to the block at point c. A word of caution here. This screw must be in the center of the base of the protractor midway between the  $0^{\circ}$  and  $180^{\circ}$  scale lines at each end of the protractor. This point is usually marked by the manufacturer, but can easily be determined if such is not the case. The spirit level is fastened to the block just below the point c. (It may be possible to mount the protractor and indicator on certain types of spirit levels.)

Operation is likewise simple. When measuring the profile of a slope, hold the "clinometer" on a level with and about twelve inches from the eye. Be sure the bubble of the spirit level is centered. (In case a spirit level is not available, a detachable plumb bob will serve the purpose as shown in Figure 4. Use a piece of wrapping twine or fish line about 12 inches long.



At one end form a small loop; at the other end suspend a heavy object such as a key or an ordinary nut. Hang the loop over screw holding indicator after drawing a line from point c perpendicular to the base of the block. Allow "plumb bob" to swing freely making sure it does not rub against instrument and hold instrument when sighting so that the string directly covers the perpendicular line drawn from screw c to base of block. The instrument will then be approximately level.) Sight through area A with the right eye and with the thumb of the right hand move the indicator until it is parallel with the slope being measured. Read degrees on protractor scale and convert to percent of slope.

In measuring the degree and/or percent of slope when facing the slope to be determined, invert the instrument so that the protractor is beneath the block of wood supporting it as shown in Figure 5. Then hold

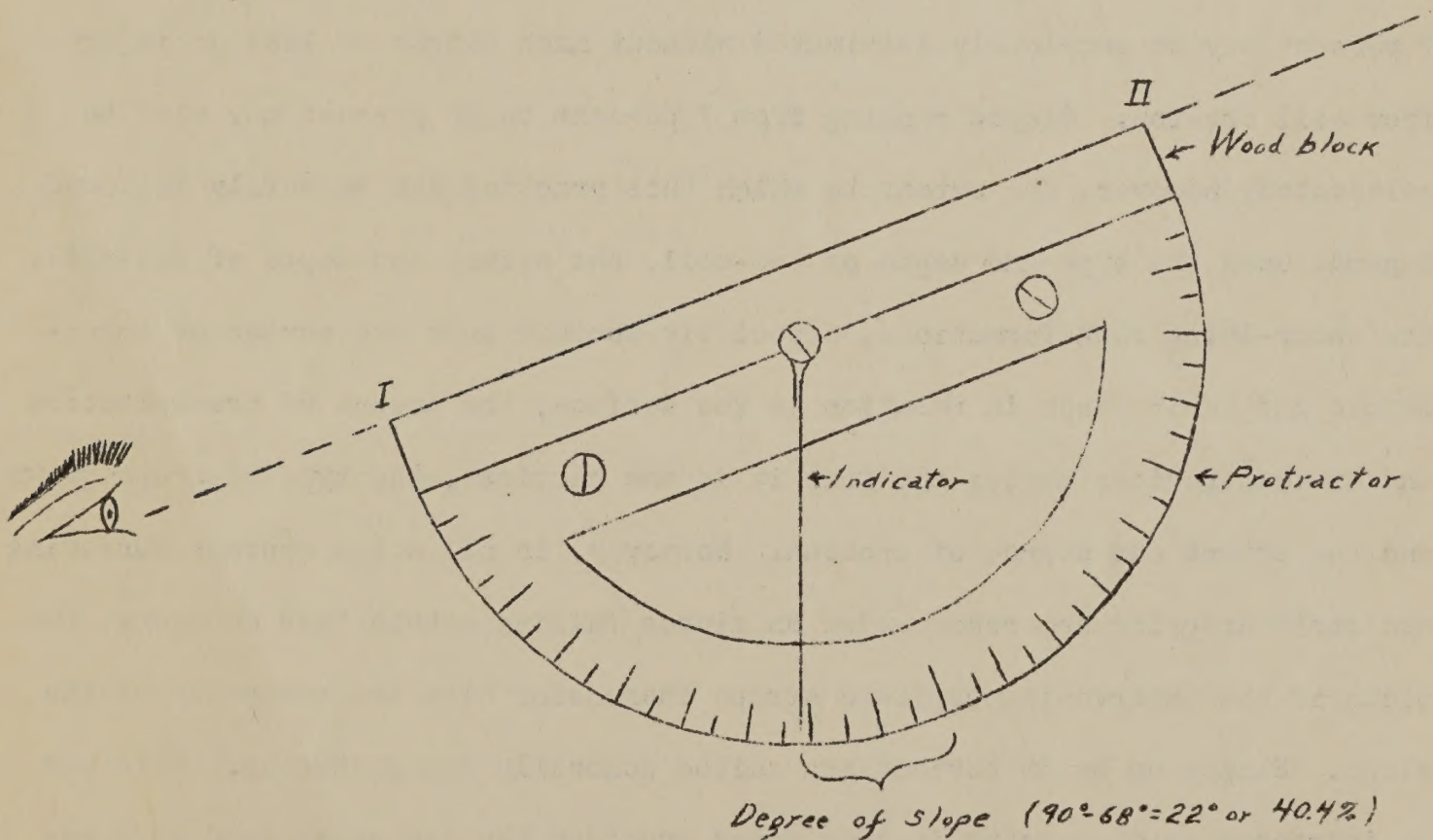


Fig. 5

block parallel with the slope. This may be facilitated by sighting along the base of the block from point I through point II as shown. The point sighted upon should be the same height above the surface as the instrument is held in order to more nearly parallel the slope. Allow indicator to swing freely until it comes to rest under gravitational pull (be sure indicator is not allowed to rub against instrument during this operation). The degree of slope will be the difference between  $90^{\circ}$  and the point where the indicator comes to rest. For instance, if the indicator comes to rest at  $68^{\circ}$  on the protractor scale, the degree of slope will be  $90^{\circ}$  minus  $68^{\circ}$  or  $22^{\circ}$  which when converted to percent of slope equals 40.4 percent.

The tin spring clip d may or may not be added. It simply serves the purpose of releasing or holding the indicator in place.

It is the consensus of opinion in West Virginia that slopes up to 7 percent may be completely cultivated without much danger of loss or injury from soil erosion. Slopes ranging from 7 percent to 25 percent may also be cultivated; however, the extent to which this practice can be safely followed depends upon the type and depth of top-soil, the nature and depth of sub-soil, the under-lying rock formations, especially whether such are porous or impermeable and their slope in relation to the surface, the amount of precipitation and at what periods during the year it is the heaviest, the type of crops grown and the extent and degree of erosion. Moreover, in all cases contour furrowing and strip cropping are recommended on slopes falling within this category, the width of the intervening unplowed strips increasing with the steepness of the slope. Slopes up to 35 percent are suited generally for pasturing. This may be increased to 40 percent in some cases provided the livestock load is carefully regulated to the carrying capacity of the land so used which calls for a

careful consideration of the factors mentioned above plus the condition of the grass. Practically all slopes over 40 percent should be in, or planted to, forest trees.

On the basis of this reasoning the following table was constructed and pasted on the back of the wooden block which supports the protractor:

Angle of slope	% of slope	
4°	7.0	All angles over
14°	24.0	22° equals more
19°	34.4	than 40% slope.
22°	40.4	

Modifications to meet requirements elsewhere may be easily made.

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# EQUIVALENT ANGLE OF SLOPE AND PERCENT SLOPE

ANGLE OF SLOPE	PERCENT SLOPE	ANGLE OF SLOPE	PERCENT SLOPE	ANGLE OF SLOPE	PERCENT SLOPE	ANGLE OF SLOPE	PERCENT SLOPE
35'	1.0	11°	19.4	20° 3'	36.5	33° 49'	67.0
52'	1.5	11° 2'	19.5	20° 18'	37.0	34°	67.4
1° 9'	2.0	11° 19'	20.0	20° 48'	38.0	34° 13'	68.0
1° 26'	2.5	11° 35'	20.5	21°	38.4	34° 36'	69.0
1° 43'	3.0	11° 52'	21.0	21° 18'	39.0	35°	70.0
2°	3.5	12°	21.3	21° 48'	40.0	35° 23'	71.0
2° 17'	4.0	12° 8'	21.5	22°	40.4	35° 45'	72.0
2° 35'	4.5	12° 24'	22.0	22° 18'	41.0	36°	72.6
2° 52'	5.0	12° 41'	22.5	22° 47'	42.0	36° 8'	73.0
3°	5.2	13°	23.0	23°	42.5	36° 30'	74.0
3° 9'	5.5	13° 13'	23.5	23° 16'	43.0	36° 52'	75.0
3° 26'	6.0	13° 30'	24.0	23° 45'	44.0	37°	75.4
3° 43'	6.5	13° 46'	24.5	24°	44.5	37° 14'	76.0
4°	7.0	14°	24.9	24° 14'	45.0	37° 36'	77.0
4° 17'	7.5	14° 2'	25.0	24° 42'	46.0	38°	78.0
4° 34'	8.0	14° 18'	25.5	25°	46.6	38° 19'	79.0
4° 52'	8.5	14° 34'	26.0	25° 10'	47.0	38° 40'	80.0
5°	8.8	14° 51'	26.5	25° 39'	48.0	39°	81.0
5° 9'	9.0	15°	26.8	26°	48.8	39° 21'	82.0
5° 26'	9.5	15° 7'	27.0	26° 6'	49.0	39° 42'	83.0
5° 43'	10.0	15° 23'	27.5	26° 34'	50.0	40°	84.0
6°	10.5	15° 39'	28.0	27°	50.9	40° 22'	85.0
6° 17'	11.0	15° 54'	28.5	27° 1'	51.0	40° 42'	86.0
6° 34'	11.5	16°	28.7	27° 29'	52.0	41°	87.0
6° 51'	12.0	16° 10'	29.0	27° 56'	53.0	41° 21'	88.0
7°	12.3	16° 26'	29.5	28°	53.2	41° 40'	89.0
7° 8'	12.5	16° 42'	30.0	28° 22'	54.0	42°	90.0
7° 24'	13.0	16° 58'	30.5	28° 49'	55.0	42° 18'	91.0
7° 41'	13.5	17°	30.6	29°	55.4	42° 37'	92.0
7° 58'	14.0	17° 13'	31.0	29° 15'	56.0	43°	93.0
8° 15'	14.5	17° 29'	31.5	29° 41'	57.0	43° 14'	94.0
8° 32'	15.0	17° 45'	32.0	30°	57.7	43° 32'	95.0
8° 49'	15.5	18°	32.5	30° 7'	58.0	43° 50'	96.0
9°	15.8	18° 16'	33.0	30° 33'	59.0	44°	96.5
9° 5'	16.0	18° 31'	33.5	31°	60.0	44° 8'	97.0
9° 22'	16.5	18° 47'	34.0	31° 23'	61.0	44° 25'	98.0
9° 39'	17.0	19°	34.4	31° 48'	62.0	44° 43'	99.0
9° 56'	17.5	19° 2'	34.5	32°	62.5	45°	100.0
10°	17.6	19° 17'	35.0	32° 13'	63.0		
10° 12'	18.0	19° 33'	35.5	32° 37'	64.0		
10° 29'	18.5	19° 48'	36.0	33°	65.0		
10° 44'	19.0	20°	36.4	33° 26'	66.0		

Taken from Appendix X, Page 722, "Field Geology", by Frederic H. Lahee, Ph. D., McGraw-Hill Book Company, Inc., New York and London, 1931, with permission of the publishers.

